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BEHAVIOR ANALYSIS AND UNSAFE DRIVING: WARNING—LEARNING TRAP AHEAD!

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CONSEQUENCE TRAPS

The young elephant in the Dublin Zoo was contained in its area by a dry moat separating it from its many young admirers. Visitors couldn't resist offering the elephant tidbits of food, despite large notices forbidding this behavior. Over time these tempting offers lured the elephant closer and closer to the edge of the moat until one day it fell in and died. This incident was hailed as a tragic accident. In fact it was the predictable consequence of an unintentional shaping (or learning) process whereby the animal's behavior was modified by rewarding consequences to be ever more risky (Baker, 1975).

This elephant trap is not unusual. For one thing it is a regular feature of our roadway jungle. Drivers often become lured into progressively more dangerous speeds on roads because speed is rewarding and they experience minimal punishing consequences. A Swedish study of speeds on narrow winding roadways (Svenson, 1978) showed that drivers ultimately learn to travel at such a speed that, should an obstruction occur around the next bend, they would have no chance of avoiding a collision. It is perhaps not surprising therefore that, for automobile drivers and motorcyclists, driving at excessive speed with regard to prevailing conditions is the largest single factor in death and injury accidents (Royal Ulster Constabulary, 1985). Such behavioral traps arise because the contingency between a particular rewarding driving behavior (traveling at a high speed) and a hazardous consequence is improbable and uncertain. Thus, drivers can gamble on the aversive consequence not occurring. We might call this kind of trap a "consequence trap" because the rewarding consequences of the risky behavior shape and maintain it. However, there are two other kinds of learning traps worth noting: the "contingency trap," to which novice drivers in particular are vulnerable, and the "conditioning trap," which is likely to catch more experienced drivers (Fuller, 1990).

CONTINGENCY TRAPS

It is not an uncommon remark from seasoned drivers that, when the novice gleefully throws away the "learner" plates after passing the driving test, he or she is only just beginning to learn what safe driving is really all about. Quite true: Inexperienced drivers must learn to discriminate the antecedents of multitudes of hazards from the antecedents of nonhazards (i.e., learn to "read the road") and to learn the contingencies between particular antecedents, particular responses, and their varied consequences (see review by Fuller, 1988). This learning is difficult because of the complexity of antecedents (which typically include in part the driver's own behavior), because of variability (unpredictability) in the contingencies between antecedents, responses, and consequences, and because unsafe behavior is infrequently punished (consequences trap). A perennial problem for transportation agencies is the difficulty of maintaining safe behavior among drivers who continuously experience feedback that such behavior is not necessary (e.g., staying within the designated speed limit).

Because of inherent difficulties of its learning methods, driving has been construed as often being a trial-and-error process (Rasmussen, 1987), with errors taking the form of near misses and, all too frequently, accidents. From this perspective, the

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disproportionate overrepresentation of young drivers in road accidents, described as being so universal as to be almost a "law of nature" (Evans, 1987), is hardly a mystery. But beyond this period of inexperience, despite years of motoring, learning on the roadway never ceases. Drivers are continuously exposed to new and complex sequences of contingencies involving punishment, reinforcement, and extinction of both safe and unsafe behaviors (cf. Summala, 1988).

Conditioning Traps

Historically it has been the responsibility of road engineers to provide drivers with discrete and unambiguous antecedent stimuli to signal hazards (i.e., particular response–consequence contingencies) ahead in the roadway. Such stimuli include warning and control signs, traffic signals, and roadside and pavement markings. But, albeit in some countries more than others, warning signs are sometimes inconsistently located, identifying, for example, a dangerous bend in the road at one point but being absent at an equally dangerous bend further along the same road. This problem is even more evident in relation to the placing of "road work ahead" warnings that are too often left in place for days, weeks, or even months after completion of the work. It is thus hardly surprising that only about half of the drivers approaching a construction and maintenance zone report reducing speed on seeing signs instructing them to slow down (Gardner & Rockwell, 1983). Over 20% said they waited until they could actually see the hazardous construction work itself. Sometimes the same warning sign signals different contingencies, such as an easily negotiated bend at one point but a definite hair-raiser at another. Sometimes warning signs identify contingencies that are only very rarely appropriate, such as the "school" sign whose warning is relevant only when children are in transit to and from the school. It should not be news to us that drivers' behavior is inadequately controlled by such antecedent stimuli. This observation was made in a recent study by Howarth (1988), who found no evidence for average speed reductions in drivers approaching schools. This was the case even when children were on the edge of the sidewalk waiting to cross the road.

What is happening in these instances is that antecedent stimuli introduced to enhance safety are failing in their function because they often do not effectively discriminate safe from unsafe situations. As a consequence, appropriate hazard avoidance responses do not come under their control, responses that in a safer world would become conditional on particular signs appearing in the road ahead.

Conclusions

The distinction between consequence, contingency, and conditioning traps is somewhat artificial because all arise out of elements of the same process, the process of learning. Their common message is that road accidents do not just happen: We *learn* to have them. The point of distinguishing between them is simply to highlight the relative importance, under various conditions, of particular features of the learning process. As described here, these features include the effects of rewards on unsafe driving behavior, the difficulty of learning contingencies in the road and traffic environment, and the failure of discriminative stimuli to bring safe driver behavior under their control.

How might we begin to eradicate these traps into which drivers are prone to fall at their peril? The general problem is that the natural contingencies of the roadway environment are often not adequate to establish and maintain safe driving behavior. This may be because the contingencies are too difficult to learn, the antecedents of hazards are too unreliable, or behaviors incompatible with safety are too strongly rewarded. As one possible solution to this type of problem, Skinner (1988) has argued that we need to reinforce rule following: in this instance the following of rules that specify safe behaviors. This strategy has had demonstrable success with safety belt promotion, where natural contingencies are not very effective at maintaining the desired behavior (e.g., Geller, Patterson, & Talbot, 1982; Kalsher, Geller, Clarke, & Lehman, 1989; Malenfant & Van Houten, 1988). The imaginative extension of this pioneering work to other aspects of driver behavior, like the desperate plight of the

hundreds of thousands of road accident victims annually, is crying out for systematic attention from behavior analysts.

REFERENCES

Baker, L. J. V. (1975). Motivation for safety. *Journal of the National Industrial Safety Organization,* **29,** 5–15.

Evans, L. (1987). *Young driver involvement in severe crashes.* Paper presented at the International Symposium on New Perspectives on Youth at Risk for Traffic Accidents, Santa Monica, CA.

Fuller, R. (1988). Psychological aspects of learning to drive. In J. A. Rothengatter & R. A. de Bruin (Eds.), *Road user behaviour: Theory and research* (pp. 527–537). Assen: Van Gorcum.

Fuller, R. (1990, September). *The modification of individual road user behaviour.* Paper presented to OECD International Road Safety Symposium "Enforcement and Rewarding: Strategies and Effects," Copenhagen, Denmark.

Gardner, D. J., & Rockwell, T. H. (1983). Two views of motorist behavior in rural freeway construction and maintenance zones: The driver and the state highway patrolman. *Human Factors,* **25,** 415–424.

Geller, E. S., Patterson, L., & Talbot, E. (1982). A behavioral analysis of incentive prompts for motivating safety belt use. *Journal of Applied Behavior Analysis,* **15,** 403–415.

Howarth, C. I. (1988). The relationship between objective risk, subjective risk and behaviour. *Ergonomics,* **31,** 527–535.

Kalsher, M. J., Geller, E. S., Clarke, S. W., & Lehman, G. R. (1989). Safety belt promotion on a naval base: A comparison of incentives vs. disincentives. *Journal of Safety Research,* **20,** 103–113.

Malenfant, J. E. L., & Van Houten, R. (1988). The effects of nighttime seat belt enforcement on seat belt use by tavern patrons: A preliminary analysis. *Journal of Applied Behavior Analysis,* **21,** 271–276.

Rasmussen, J. (1987). Risk and information processing. In W. T. Singleton & J. Hovden (Eds.), *Risk and decisions* (pp. 109–122). Chichester: Wiley.

Royal Ulster Constabulary. (1985). *Death and injury road accidents in Northern Ireland 1985.* Belfast: Traffic Division Headquarters.

Skinner, B. F. (1988). *Beyond freedom and dignity.* London: Peregrine.

Summala, H. (1988). Risk control is not risk adjustment: The zero-risk theory of driver behaviour and its implications. *Ergonomics,* **31,** 491–506.

Svenson, O. (1978). Risks of road transportation in a psychological perspective. *Accident Analysis & Prevention,* **10,** 267–280.

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